A REVISION OF THE GENUS *XIPHOTHECA* (FABACEAE)[1]

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ABSTRACT

The genus *Xiphotheca* Eckl. & Zeyh. consists of nine species, all endemic to the Flora Capensis region of South Africa: *X. canescens, X. cordifolia, X. elliptica, X. fruticosa, X. guthriei, X. lanceolata, X. phylicoides, X. reflexa,* and *X. tecta.* Morphological, chemical, and cytological characters of the genus are briefly discussed. A cladistic analysis, based on morphological data, shows that there are two distinct groups in the genus. These are described as two sections, sects. *Congestae* and *Xiphotheca.* Full descriptions, diagnostic characters, illustrations, and distribution maps of the species are presented.

When De Candolle (1825a, b, 1826) described the genus *Priestleya,* he established two sections: *P.* sect. *Aneisothea* (with the calyx base attenuate) and *P.* sect. *Priestleya* (with the calyx base intrusive or "thrust in"). In 1836, Ecklon and Zeyher constituted the genus *Xiphotheca* by according generic status to *P.* sect. *Aneisothea.* This concept was not accepted by their successors (Meyer, 1836; Walpers, 1839; Bentham, 1843, 1865; Harvey, 1862; Hutchinson, 1964), who chose to follow De Candolle's classification. Recently, however, Schutte and Van Wyk (1993) offered additional evidence in support of Ecklon and Zeyher's (1836) concept and subsequently reinstated the genus *Xiphotheca.* The name *Xiphotheca* is a compound word, derived from the Greek words "xipho-" meaning sword-like and "-theca" meaning case or container, which refers to the shape of the pod.

Xiphotheca is a genus of papilionoid legumes comprising nine species, which are all endemic to the Cape fynbos region of South Africa. It is a member of the tribe Liparieae, which differs from the closely related tribe Podalyrieae in the fusion of the stamens into an open sheath or a closed tube. The Podalyrieae have the stamens free almost to the base (Polhill, 1976, 1981a, b). In a recent phylogenetic analysis of relationships between the genera of the Podalyrieae and Liparieae, Van Wyk and Schutte (1995) showed that *Xiphotheca, Amphithalea* Eckl. & Zeyh., and *Coelidium* Vogel ex Walp. are undoubtedly monophyletic, but that more research is needed to clarify the positions of some of the other genera. Data, gained from chemical investigations, have brought new insights into the relationships between the two tribes. The results of this investigation will be published elsewhere.

The diagnostic characters of *Xiphotheca* are the relatively unspecialized bright yellow flowers; the decussate, 2-flowered inflorescences; the non-intrusive calyx base (except for one species); the fusion of the bract with the base of the pedicel; the presence of bracteoles (albeit sometimes strongly reduced); the laterally compressed pods, which are constricted between the seeds; and the presence of anabasine as a major alkaloid. From its closest relatives, *Amphithalea* and *Coelidium,* it differs in the shape of the seed aril, which lacks the extension toward the lens; the generally higher ovule number; and the absence of ammodendrine as a major alkaloid.

Apart from a brief synopsis, in which the nomenclature, synonymy, and typification of the species are discussed (Schutte & Van Wyk, 1993), no taxonomic treatment of the group has been published since Harvey's in 1862. The aim of this paper is to present a revision of *Xiphotheca,* in which a phylogeny is proposed for the genus, followed by an identification key, full descriptions, illustrations, and distribution maps of the species.

MATERIALS AND METHODS

Data on the morphological variation of the taxa were gathered from herbarium collections of BM, BOL, C, G, G-DC, JRAU, K, LD, LINN, MO, NBG, P, PRE, S, SAM, SBT, TCD, UPS, W, WU, and Z

[1] This study formed part of a Ph.D. thesis in Botany at the Rand Afrikaans University. I am indebted to B.-E. van Wyk for supervising the study. The directors and staff of the mentioned herbaria are thanked for loans of specimens. My husband, J. H. J. Vlok (Cape Nature Conservation), kindly offered advice and assistance during collecting trips. Financial support from the Foundation for Research Development is acknowledged.

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(acronyms as in Holmgren et al., 1981), as well as from fresh or preserved material collected during field trips.

The methods applied in the alkaloid study are described by Van Wyk et al. (1991a, b). Voucher specimens of the material used for the extraction of alkaloids are also listed.

Cladograms were generated by using the computer software package Hennig 86 (Farris, 1988). Character states were polarized using the method of outgroup comparison. It is important to note that autapomorphies for the different species have been omitted from the analysis, since they serve no purpose as grouping characters. The "mhennig*," "bb*," and "ie" algorithms were applied to produce trees of minimal length.

Morphological Characters

HABIT

The variation in habit found in *Xiphotheca* includes single-stemmed, tree-like shrubs up to 2.5 m tall, many-stemmed, virgate shrubs up to 1.2 m tall, and prostrate or straggling shrublets of up to 0.5 m tall. Adaptations to survive recurrent fires have had a major influence on the life forms and habit of the taxa, since all are restricted to the fire-prone fynbos vegetation of the Cape (Le Maitre & Midgley, 1992; Schutte et al., 1995). There are two main fire survival strategies: sprouters and non-sprouters. Sprouters have a lignotuber from which new growth takes place after fire, resulting in a many-stemmed appearance at ground level. Non-sprouters, on the other hand, can only reproduce from seed after fire and are easily recognized by the presence of a single main stem, at least at ground level (Schutte et al., 1995).

At the specific level, the ability to resprout or reseed after fire is a taxonomically important and very useful character in *Xiphotheca.* For example, *X. canescens* (Thunb.) A. L. Schutte & B.-E. van Wyk and *X. elliptica* (DC.) A. L. Schutte & B.-E. van Wyk look morphologically very similar, especially on herbarium sheets, but have different fire-survival strategies.

Fire survival strategy is not included as a character in the cladistic analyses because it is a polymorphic character. In *X. fruticosa,* some populations are sprouters, while other populations consist of non-sprouting individuals.

LEAVES

All the species of *Xiphotheca* have simple, petiolate, and distinctly pinnately veined leaves. Stipules are invariably present, but reduced in size. Leaves are generally flat, except in *X. phylicoides* A. L. Schutte & B.-E. van Wyk, where the margins are strongly revolute. The vestiture of the leaves varies among the species from pubescent to sericeous to tomentose or velutinous, and some of the species can be identified by their leaf indumentum.

INFLORESCENCES

Xiphotheca has axillary, simple racemose inflorescences, with geminate flowers. At the infrageneric level, inflorescences are particularly useful in distinguishing between some of the species. In *X. canescens, X. cordifolia* A. L. Schutte & B.-E. van Wyk, *X. elliptica,* and *X. phylicoides,* the inflorescences are distinctly pedunculate. They are either borne on lateral twigs, as in *X. canescens, X. cordifolia,* and *X. elliptica,* or borne on the main stem as in the remainder of the species. In *X. fruticosa* (L.) A. L. Schutte & B.-E. van Wyk, *X. guthriei* (L. Bolus) A. L. Schutte & B.-E. van Wyk, *X. lanceolata* (E. Mey.) Eckl. & Zeyh., and *X. reflexa* (Thunb.) A. L. Schutte & B.-E. van Wyk, the inflorescence-supporting leaves are smaller than the other vegetative leaves and the inflorescence units are congested. The flowers are totally concealed by the leaves below the inflorescence units in *X. guthriei* and *X. lanceolata.* All the species have the bracts fused with the pedicel at the base for a distance of 0.5 to 1.0 mm. Bracteoles are conspicuous in *X. canescens, X. elliptica,* and *X. phylicoides,* strongly reduced in *X. cordifolia, X. reflexa,* and *X. tecta* (DC.) A. L. Schutte & B.-E. van Wyk, and absent in the other species.

FLOWERS

Calyx. An attenuate calyx base is characteristic of *Xiphotheca.* There is, however, one species that has an intrusive calyx base (Schutte & Van Wyk, 1993), but it is here regarded as a secondary development. The upper two calyx lobes are invariably fused higher up than the lower three lobes. *Xiphotheca fruticosa, X. guthriei, X. lanceolata,* and *X. reflexa* are exceptional in having the carinal calyx lobe notably longer than the other lobes. The shape of the calyx lobes is a significant taxonomic character that varies from narrowly triangular and acuminate to rounded and obtuse.

Corolla. The corolla is yellow and relatively unspecialized in *Xiphotheca* and tends to turn brown with age. Keel petals are obtuse, distinctly pocketed, and auriculate. The pocket on the wing petal is a thickened lobe, formed on the inside (ab-

axial side), but *X. tecta* is unusual in having a well-developed pocket conspicuous also on the adaxial side. Wing petal sculpturing is invariably present in the upper basal area. The wing auricle is well differentiated in *X. canescens* and *X. elliptica*, but weakly so in the other species.

Stamens. In *Xiphotheca* the stamens are diadelphous and the anthers almost uniform in shape and size. The mode of attachment of the filaments is alternately dorsifixed and subbasifixed.

Pistils. The number of ovules varies from two to eight in the genus. These differences are useful in distinguishing between some species.

FRUITS AND SEEDS

The significance of fruit characters as a taxonomic character for *Xiphotheca* is obvious; the generic name alludes to the shape of the pod. Pods are sessile, laterally compressed, and constricted between the seeds in *Xiphotheca*. The seeds are arillate and vary in color from uniformly green or brown to green, mottled brown and brown, mottled black.

Chromosome Number

Chromosome numbers of only three species have so far been recorded: *X. fruticosa*, *X. guthriei*, and *X. tecta*. All have $2n = 18$ (Dahlgren, 1967; Schutte, 1995). A basic chromosome number of $x = 9$ seems likely. This is in accordance with the proposed base number for the tribe Liparieae (Goldblatt, 1981).

Alkaloids

Alkaloids have proved to be of great significance at the generic level. In fact, it was one of the most convincing characters used to motivate the reinstatement of *Xiphotheca* as a genus (Schutte & Van Wyk, 1993). The major alkaloids detected in *Priestleya* DC. sect. *Aneisothea* DC. (now *Xiphotheca*) were anabasine (a bipiperidyl alkaloid) and lupinine (a bicyclic quinolizidine alkaloid), while a combination of lupanine- and sparteine-type alkaloids (all tetracyclic quinolizidine alkaloids) and minor quantities of ammodendrine (a bipiperidyl alkaloid) were located in *Priestleya* sensu stricto (Van Wyk et al., 1991b). This offered additional support to morphological evidence that *Priestleya* is paraphyletic, which subsequently resulted in the reinstatement of *Xiphotheca* (Schutte & Van Wyk, 1993). At the specific level, no clear pattern in variation could be found, since the differences were of a quantitative, rather than a qualitative, nature.

Table 1. Characters and character states used for the cladistic analysis of the genus *Xiphotheca*. The fully resolved cladogram generated from this data set is shown in Figure 1.

Taxa	Character states
AMPHITHALEA	00000 00000 0
X. canescens	01101 11001 1
X. cordifolia	01101 1000? 1
X. elliptica	01101 11001 1
X. fruticosa	10010 00100 0
X. guthriei	10020 00110 0
X. lanceolata	10020 00110 0
X. phylicoides	01001 10000 0
X. reflexa	10010 10110 1
X. tecta	01000 10000 1

Characters

1. Inflorescence supporting leaves: similar to others (0); reduced in size (1).
2. Inflorescence units: congested (0); not congested (1).
3. Inflorescences: borne on main stems (0); borne on lateral twigs (1).
4. Inflorescences: not concealed by leaves below inflorescence units (0); partly concealed by leaves below inflorescence units (1); totally concealed by leaves below inflorescence units (2).
5. Peduncles: absent (0); present (1).
6. Bracteoles: absent (0); present (1).
7. Calyx lobes: acuminate (0); not acuminate (1).
8. Calyx lower lobe: as long as the others (0); longer than the other lobes (1).
9. Vestiture: pubescent (0); not pubescent (1).
10. Wing petals: auricle weakly developed or absent (0); distinctly auriculate (1).
11. Ovule number: 2 (0); more than 2 (1).

Infrageneric Relationships

Xiphotheca is defined by at least three unambiguous apomorphies and one subject to variation: (1) the presence of bracteoles in most species; (2) the fusion of the bracts with the base of the pedicel; (3) the laterally compressed pods; and (4) the accumulation of anabasine as a major alkaloid.

For the phylogenetic analysis, *Amphithalea* was chosen as outgroup, since it is the genus most closely related to *Xiphotheca* (Van Wyk & Schutte, 1995). A data set was compiled using 10 taxa and 11 characters (Table 1). Two fully resolved trees resulted, both with a length of 15 and a consistency index of 80. The one most favored is shown in Figure 1. In the other tree the positions of *X. tecta* and *X. phylicoides* are switched. The cladogram indicates two major clades: a *Xiphotheca guthriei*-group (A), subtended by three synapomorphies, and a *Xiphotheca canescens*-group (B) supported by one apomorphy. These two infrageneric groups are given formal taxonomic rank below.

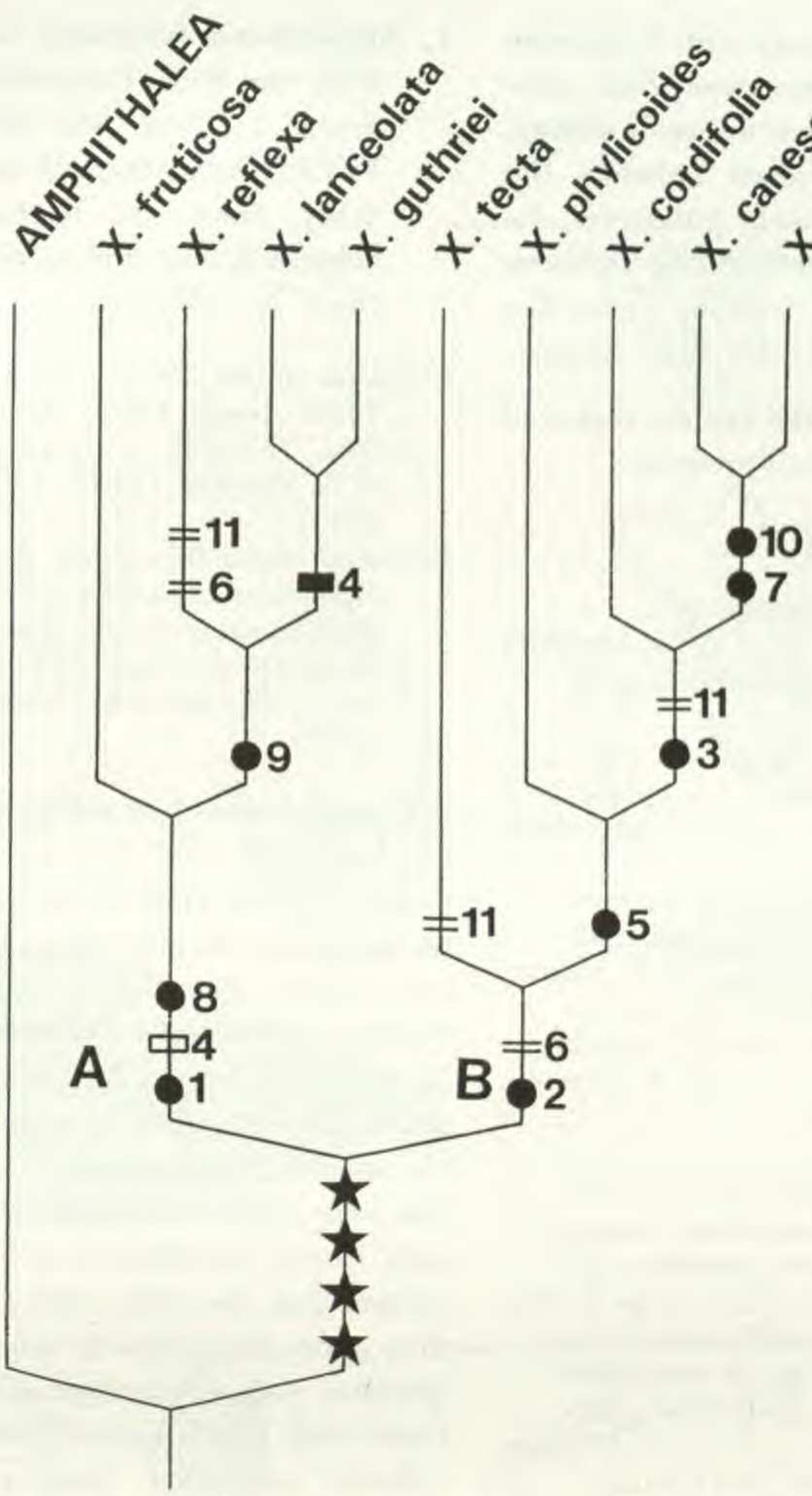

Figure 1. Fully resolved cladogram of relationships in the genus *Xiphotheca*, based on the data set in Table 1 [dot, an apomorphy without homoplasy; rectangle, an apomorphy with subsequent reversal or successive states of a multistate character; =, a convergence; stars, generic apomorphies (see text)].

Taxonomic Treatment

Xiphotheca Eckl. & Zeyh., Enum. Pl. Afric. Austral. 2: 166. 1836. TYPE: *Xiphotheca rotundifolia* Eckl. & Zeyh. (lectotype, designated by Schutte & Van Wyk, 1993) [= *Xiphotheca tecta* (Thunb.) A. L. Schutte & B.-E. van Wyk].

Priestleya DC. sect. *Aneisothea* DC., in Ann. Sci. Nat. 4: 91. 1825, Prodr. 2: 121. 1825. TYPE: *Priestleya elliptica* DC. (lectotype, designated by Schutte & Van Wyk, 1993) [= *Xiphotheca elliptica* (DC.) A. L. Schutte & B.-E. van Wyk].

Woody shrubs or shrublets. *Leaves* alternate or rarely opposite or subopposite, simple, narrowly elliptic to almost circular, mostly flat, sometimes with recurved margins, pinnately veined; petiole short, ± 1 mm long; stipules inconspicuous, less than 0.5 mm long. *Inflorescence* axillary, 2-flowered, with the two flowers opposite, aggregated into synflorescences of up to 20 flowers. *Bracts* linear to oblanceolate, fused at the base with pedicel for 0.5–1.0 mm. *Bracteoles* minute, sometimes lacking. *Corolla* yellow, longer than the calyx, glabrous. *Calyx* narrowed to the base, rarely intrusive; upper two lobes fused higher up than the lower three lobes; carinal lobe sometimes longer than the upper four. *Standard petal* suborbicular to elliptic; apex emarginate. *Wing petals* oblong, longer than the keel; the tips imbricate; pocket developed as a thickened lobe toward the inside. *Keel petals* widely obovate, with weakly developed pockets, apex obtuse. *Stamens* diadelphous, the vexillary filament free; anthers ± uniform in shape and size, alternately dorsifixed and subbasifixed. *Pistil* sessile; style slender,

slightly upcurved, glabrous; ovary with 2 or more ovules, densely sericeous to tomentose. *Pods* coriaceous, usually linear, sometimes obliquely oblong, laterally compressed, constricted between the seeds, 2 to many seeded, densely pubescent, tomentose, villous or glabrous. *Seeds* oblong-reniform; hilum elliptic, surrounded by a fleshy collar-like aril. Chromosome number $2n = 18$. Nine species.

Xiphotheca is restricted to the fynbos region of the Western and Northern Cape Provinces.

KEY TO THE SPECIES OF *XIPHOTHECA*

1. Leaves opposite; calyx base intrusive ..... 7. *X. cordifolia*
1. Leaves subopposite or alternate; calyx base not intrusive 2
2(1). Inflorescences pedunculate 3
2. Inflorescences not pedunculate 5
3(2). Ovary with 2 ovules ..... 5. *X. phylicoides*
3. Ovary with 5 or more ovules 4
4(3). Leaves elliptic, with slightly revolute margins; many-stemmed shrubs up to 1 m tall; pods densely pubescent ..... 9. *X. elliptica*
4. Leaves narrowly elliptic, with flat margins; single-stemmed tree-like shrubs up to 2.5 m tall; pods ± glabrous ..... 8. *X. canescens*
5(2). Ovary with 5 or more ovules 6
5. Ovary with 2 or 3 ovules 7
6(5). Wing petal with pocket conspicuous on outer surface; calyx shorter than keel, lobes triangular, tomentose; seeds green, not mottled ..... 6. *X. tecta*
6. Wing petal with pocket not conspicuous on outer surface; calyx ± as long as the keel, lobes narrowly triangular, villous; seeds brown, mottled black ..... 2. *X. reflexa*
7(5). Lower calyx lobe much longer than the tube ..... 3. *X. lanceolata*
7. Lower calyx lobe as long as or shorter than the tube 8
8(7). Leaves elliptic, silver, densely sericeous (long silky appressed hairs) on both surfaces; bracts 5–9 mm long; seeds pale greenish brown, mottled dark brown ..... 1. *X. fruticosa*
8. Leaves narrowly elliptic, green, sparsely velutinous (long soft upright hairs) on both surfaces, densely so on margins; bracts ± 2.5 mm long; seeds uniformly brown ..... 4. *X. guthriei*

Section 1. Xiphotheca sect. **Congestae** A. L. Schutte, sect. nov. TYPE: *Xiphotheca reflexa* (Thunb.) A. L. Schutte & B.-E. van Wyk.

Sectioni *Xiphothecae* similis, sed inflorescentiis partialibus congestis et lobo calycis carinali longiori differt.

Section *Congestae* is similar to section *Xiphotheca* but deviates in its congested inflorescence units and in the carinal lobe of the calyx that is longer than the upper four lobes. This section comprises four species.

1. Xiphotheca fruticosa (L.) A. L. Schutte & B.-E. van Wyk, Taxon 42: 46. 1993. *Lotus fruticosus* L., Syst. Nat. (ed. 10): 1179. 1759. TYPE: South Africa. Western Cape, without locality, *Anon. s.n.* (lectotype, designated by Schutte & Van Wyk (1993), S, Linnaeus Type Herb. No. S293.5).

Crotalaria lanata Thunb., Prodr. Pl. Cap.: 124. 1800. TYPE: South Africa. Western Cape, "e Cap. b. Spei," *Thunberg s.n.* (lectotype, designated by Schutte & Van Wyk (1993), UPS, Herb. Thunberg No. 16557).

Priestleya villosa DC., Prodr. 2: 122. 1825, *nom. illeg.* *Xiphotheca villosa* (DC.) Eckl. & Zeyh., Enum. Pl. Afric. Austral. 2: 166. 1836. TYPE: South Africa. Western Cape, "Cap. de B. Esp.," *Lambert s.n.* (lectotype, designated by Schutte & Van Wyk (1993), G-DC).

Single-stemmed, tree-like shrub up to 2 m tall, not sprouting after fire, or sometimes, a many-stemmed shrub up to 0.7 m tall, sprouting after fire; woody rootstock sometimes present. *Leaves* alternate, elliptic, flat, silvery, densely sericeous on both surfaces, glabrescent. *Inflorescences* aggregated into head-like synflorescences at tips of main branches, somewhat concealed by supporting leaves; peduncle absent. *Bracts* narrowly elliptic to linear, 5–9 mm long. *Pedicel* 2.5–3.0 mm long. *Bracteoles* absent. *Calyx* not intrusive at base; lobes acuminate, shorter than the tube; carinal lobe slightly longer than upper four; densely sericeous. *Wing petals* auriculate; pocket inconspicuous on outer surface. *Ovary* with 2 to 3 ovules; densely tomentose. *Pods* inflated; tomentose. *Seeds* pale greenish brown, mottled dark brown. Figure 2.

Xiphotheca fruticosa is found on the Cape Peninsula-, Hottentotsholland-, Hex River-, and Touwsberg Mountains, as well as on the mountains near Montagu and hills near Bredasdorp (Fig. 3). It grows in a sandy loamy soil at altitudes of 100 to 1200 m.

This species resembles *X. guthriei* but differs in longer bracts and long silky appressed, not velutinous, hairs on the leaves.

Both sprouting and non-sprouting growth forms occur in this species. Populations from the Bredasdorp-Elim area resprout after fire, while those from the other localities do not. This difference in growth form may be significant, but more fieldwork is needed before specific or infraspecific status can be assigned with certitude.

Selected specimens examined. **Non-sprouting form:** SOUTH AFRICA. Cape Peninsula: Noord Hoek Mountain, *Barker 2080* (NBG). Cape Town: Devil's Peak, *Bolus 3765* (SAM). Simons Town: Chapman's Peak, *Pillans s.n.*

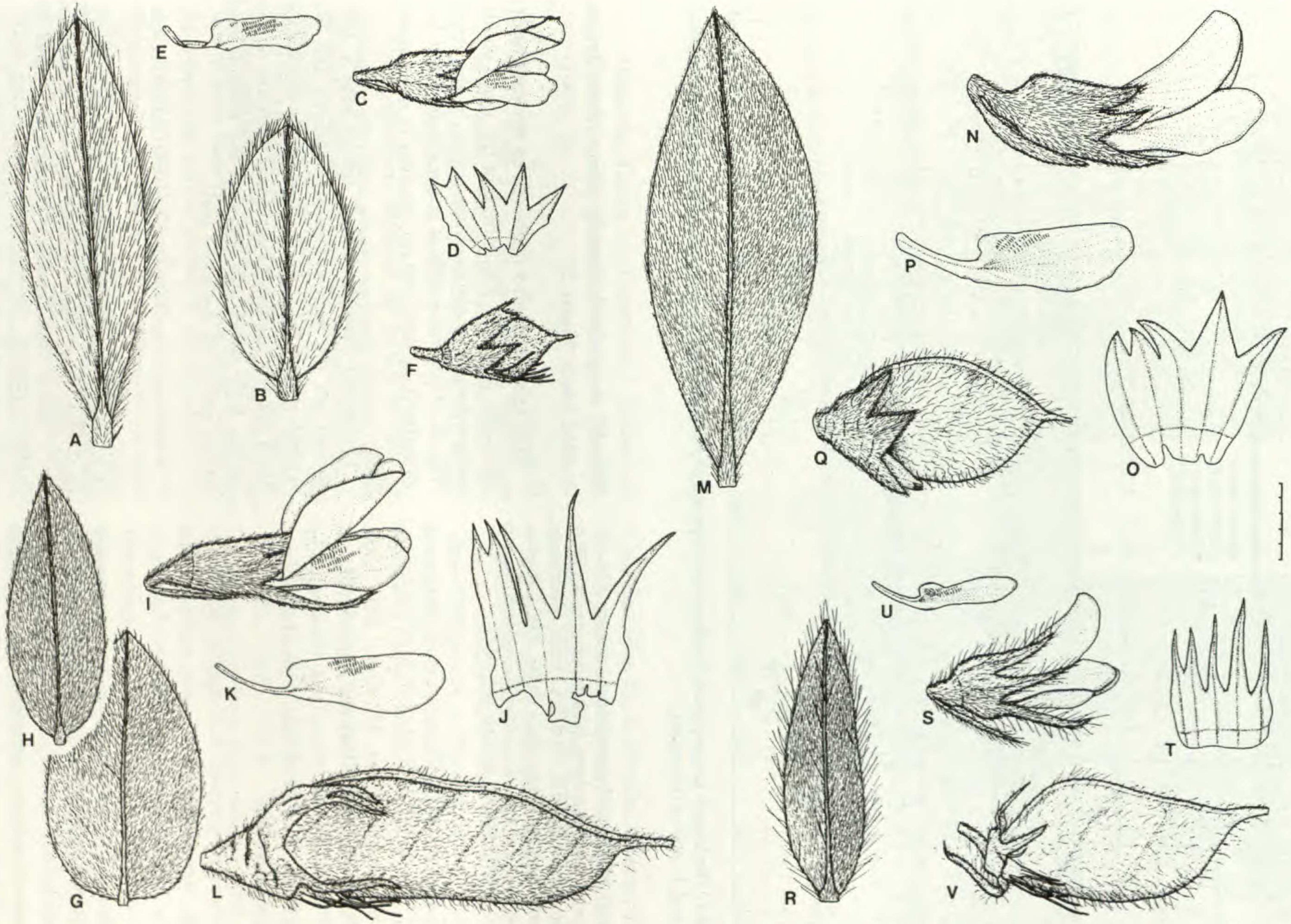

Figure 2. A–F. *Xiphotheca guthriei*. G–L. *X. reflexa*. M–Q. *X. fruticosa*. R–V. *X. lanceolata*. A, B, G, H, M, R: leaves, abaxial view; C, I, N, S: flowers in lateral view; D, J, O, T: calyces (upper lobes to the left); E, K, P, U: wing petals; F: immature fruit; L, Q, V: mature fruits. A: *Vlok & Schutte 4*; B, D, F: *Guthrie 3866*; C, E: *Oliver 4288*; G, H: *Bolus 3697*; I, J, K: *Luckhoff s.n.*; L: *Taylor 6039*; M: *Schutte 720*; N, O, P: *Schutte 675*; Q: *anon. 130*; R, T, U: *Pillans 6264*; S: *Barker 1644*; V: *Boucher 3393*. Scale in mm.

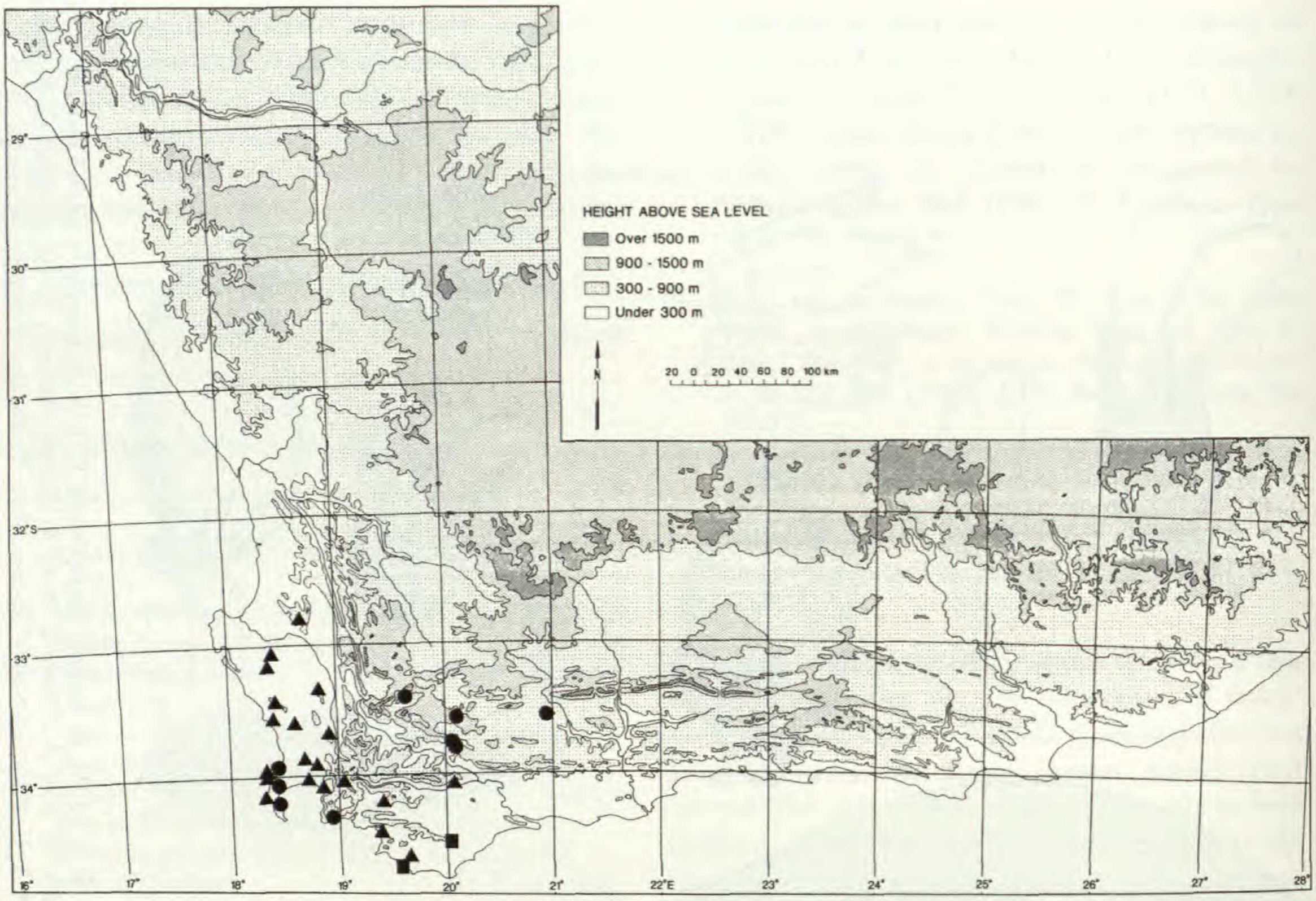

Figure 3. The known geographical distribution of *Xiphotheca fruticosa* (dots, non-sprouting form; squares, resprouting form) and *X. reflexa* (triangles).

(BOL 51233). Montagu: Pypsteelfontein, *Schutte 673–675* (JRAU). Ladismith: Touwsberg, *Vlok & Schutte 155* (MO). **Sprouting form:** SOUTH AFRICA. Elim: Koueberge, kloof above Nuwepos, *Oliver 5854* (NBG, PRE). Bredasdorp: upper slopes of mountain above Bredasdorp, *Burgers 2708* (NBG, PRE), *Vlok & Schutte 365* (MO).

2. Xiphotheca reflexa (Thunb.) A. L. Schutte & B.-E. van Wyk, Taxon 42: 47. 1993. *Crotalaria reflexa* Thunb., Prodr. Pl. Cap.: 125. 1800. TYPE: South Africa. Western Cape, "e Cap. b. Esp." *Thunberg s.n.* (lectotype, designated by Schutte & Van Wyk (1993), UPS, Herb. Thunberg no. 16576).

Many-stemmed prostrate to straggling shrub up to 0.5 m tall, sprouting from a woody rootstock after fire. *Leaves* alternate, ovate to lanceolate, flat, densely sericeo-tomentose on both surfaces, glabrescent. *Inflorescences* scattered along main branches, partly concealed by supporting leaves; peduncle absent. *Bracts* linear, 5–8 mm long. *Pedicel* 2.5–3.0 mm long. *Bracteoles* minute, caducous. *Calyx* not intrusive at base; lobes acuminate, much longer than the tube; carinal lobe longer than the upper four, almost as long as the keel petals; densely sericeous. *Wing petals* auriculate; pocket inconspicuous on outer surface. *Ovary* with 5–7 ovules; densely sericeous. *Pods* laterally compressed; densely villous. *Seeds* brown, mottled black. Figure 2.

This species is also restricted to the southwestern Cape, from the Piquetberg in the north southeastward to the Caledon-Elim region in the south (Fig. 3). *Xiphotheca reflexa* is usually found at low altitudes (less than 300 m), growing in deep sandy soils.

Characters distinguishing *X. reflexa* from *X. lanceolata* are the sericeo-tomentose leaves and the several-seeded (5–7) pods. *Xiphotheca lanceolata* has a densely appressed-sericeous vestiture on the leaves, with rather stiff hairs on the margins and midrib and 2- or 3-seeded pods.

Selected specimens examined. SOUTH AFRICA. Malmesbury: Farm Bokbaai near Darling, *Barker 10589* (NBG). Stellenbosch: Bottelary, *Compton 12935* (NBG). Malmesbury: near Hopefield, *Compton 18928* (NBG). Cape Town: lower slopes of Table Mountain, *Esterhuysen 15637* (BOL). Cape Peninsula: Oranjezicht, *Penfold 98* (NBG).

3. Xiphotheca lanceolata (E. Mey.) Eckl. & Zeyh., Enum. Pl. Afric. Austral. 2: 167. 1836. *Priestleya lanceolata* E. Mey., Linnaea 7: 150. 1832. TYPE: South Africa. Western Cape,

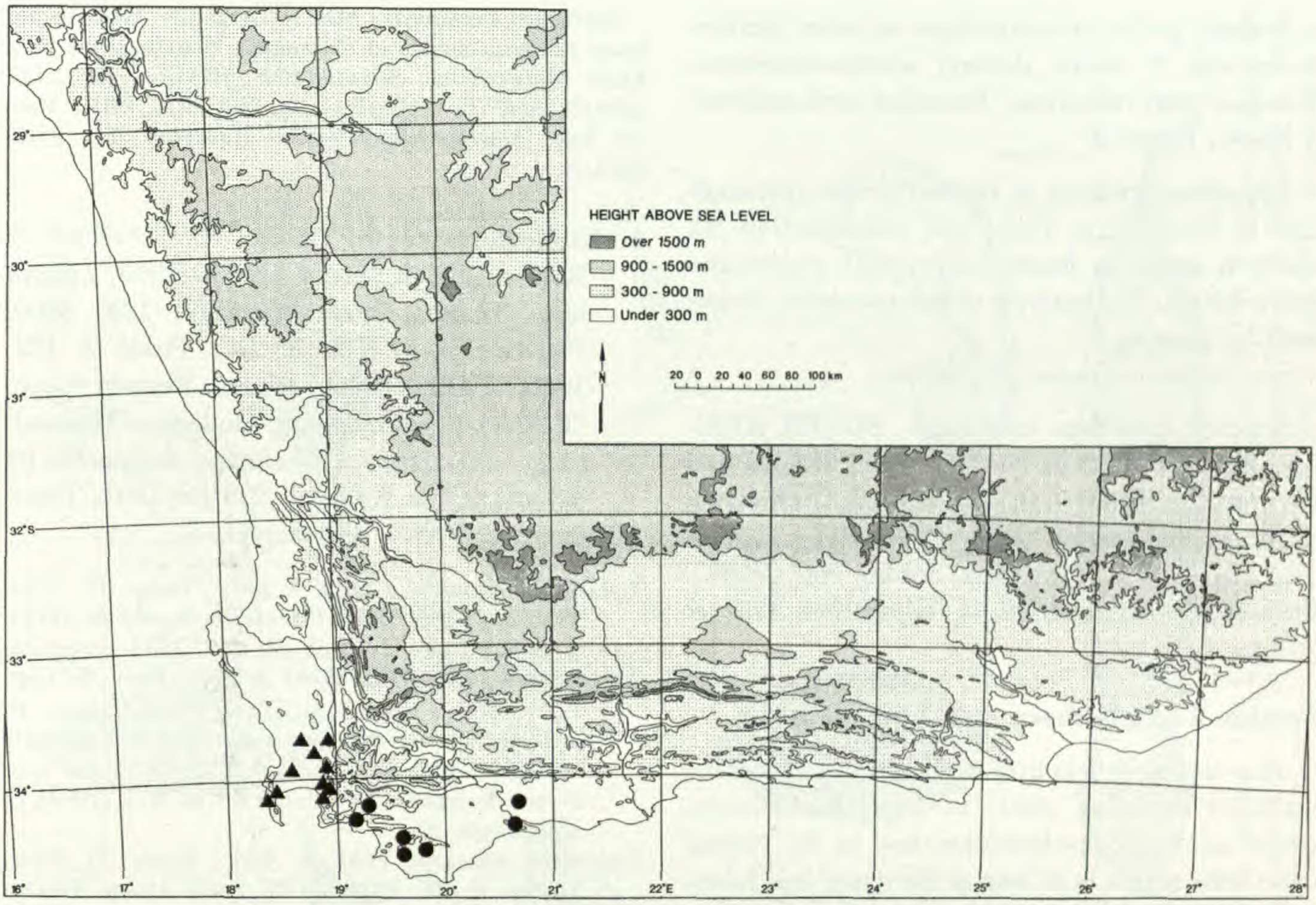

Figure 4. The known geographical distribution of *Xiphotheca lanceolata* (triangles) and *X. guthriei* (dots).

"Kapsche Fläche bei Constantia," *Ecklon s.n.* (lectotype, designated by Schutte & Van Wyk (1993), S).

Priestleya glauca T. M. Salter, J. S. Afr. Bot. 8: 256. 1942. TYPE: South Africa. Western Cape, on lower slopes of Hercules' Pillar, Joostenberg, *Pillans 6264* (lectotype, designated by Schutte & Van Wyk (1993), BOL; isolectotypes, K, NBG).

Single-stemmed shrublet up to 0.6 m tall, not sprouting after fire; woody rootstock absent. *Leaves* alternate, narrowly elliptic, flat, densely appressed-sericeous on both surfaces with long, rather stiff hairs on margins and midrib, glabrescent. *Inflorescences* aggregated into head-like synflorescences at tips of main branches, almost completely concealed by supporting leaves; peduncle absent. *Bracts* linear, 5.5–6.0 mm long. *Pedicel* ± 1.5 mm long. *Bracteoles* absent. *Calyx* not intrusive at base; lobes acuminate, much longer than the tube; carinal lobe longer than the upper four; densely sericeous with long, rather stiff hairs on lobes and main veins. *Wing petals* auriculate; pocket inconspicuous on outer surface. *Ovary* with 2 or 3 ovules; hirsute. *Pods* laterally compressed; hirsute. *Seeds* pale brown, mottled dark brown. Figure 2.

Xiphotheca lanceolata is a rare species that occurs only on the granite hills in and around the Cape flats (Fig. 4), at altitudes between 60 and 200 m. It is seriously threatened by urban development.

See discussion under *X. reflexa.*

Selected specimens examined. SOUTH AFRICA. Stellenbosch: Faure, *Barker 4121* (NBG). Somerset West: Vergelegen, *Compton 6410* (NBG). Paarl: top of granite hill above Nooitgedacht, *Dahlgren & Strid 4109* (LD); Northern slopes of Joostenberg, *Pillans 6264* (BOL, NBG). Stellenbosch: Sir Louwry's Pass, *Stokoe s.n.* (SAM 64930).

4. Xiphotheca guthriei (L. Bolus) A. L. Schutte & B.-E. van Wyk, Taxon 42: 46. 1993. *Priestleya guthriei* L. Bolus, Ann. Bolus Herb. 4: 125. 1928. TYPE: South Africa. Western Cape, hills near Elim, *Guthrie 3866* (holotype, BOL).

Single-stemmed shrub up to 0.3 m tall, not sprouting after fire; woody rootstock absent. *Leaves* alternate, elliptic to narrowly elliptic, flat, velutinous on both surfaces, glabrescent. *Inflorescences* aggregated into head-like synflorescences at tips of main branches, almost completely concealed by supporting leaves; peduncle absent. *Bracts* linear, ± 2.5 mm long. *Pedicel* ± 2 mm long. *Bracteoles* absent. *Calyx* not intrusive at base; lobes triangular acuminate, ± as long as the tube; carinal lobe as long as lateral lobes; velutinous. *Wing petals* not

auriculate; pocket inconspicuous on outer surface. *Ovary* with 2 ovules; densely sericeo-tomentose. *Immature pods* velutinous. *Immature seeds* uniformly brown. Figure 2.

Xiphotheca guthriei is limited to the surroundings of Bredasdorp, Elim, and Caledon (Fig. 4), where it grows in loamy, clayey soil at altitudes below 250 m. The survival of this species is threatened by farming.

See discussion under *X. fruticosa.*

Selected specimens examined. SOUTH AFRICA. Bredasdorp: Kourivier, between Napier and Stanford, *Jordaan 976* (C); Farm Klein Uintjieskuil just E of Viljoenshof, *Oliver 4288* (PRE). Heidelberg: hill N of Verkykerskop, *Schutte 760* (JRAU). Bredasdorp: ca. 3 km E of Viljoenshof, *Vlok & Schutte 4* (JRAU).

Section 2. **Xiphotheca** sect. **Xiphotheca**

This section differs from section *Congestae* in the extended flowering units, in the inflorescences, which are mostly pedunculate, and in the carinal calyx lobe, which is as long as the upper four lobes. It contains five species.

5. Xiphotheca phylicoides A. L. Schutte & B.-E. van Wyk, Taxon 42: 48. 1993. TYPE: South Africa. Oudtshoorn district, lower northern slopes of Outeniqua Mountains on farm Klein Moerasrivier, *Vlok 2640* (holotype, PRE; isotypes, B, BOL, JRAU, K, MO, NBG).

Many-stemmed shrub up to 1.2 m tall, sprouting from a woody rootstock after fire. *Leaves* alternate, elliptic to narrowly elliptic, with strongly revolute margins, sparsely sericeous on adaxial surface, soon becoming glabrous, densely sericeous on abaxial surface. *Inflorescences* borne along main branches; peduncle 1.5–2.5 mm long. *Bracts* linear to narrowly elliptic, 3–4 mm long. *Pedicel* 3.5–5.0 mm long. *Bracteoles* ± 0.5 mm long, caducous. *Calyx* not intrusive at base; lobes acuminate, ± as long as the tube; carinal lobe as long as lateral lobes; densely pubescent. *Wing petals* weakly auriculate; pocket inconspicuous on outer surface. *Ovary* with 2 ovules; densely pubescent. *Immature pods* laterally compressed; pubescent. *Seeds* unknown. Figure 5.

This species is known from only two localities on the Outeniqua Mountains near Mossel Bay (Fig. 6). *Xiphotheca phylicoides* is found in pebbly loamy soil at altitudes between 530 and 800 m.

The leaves of *X. phylicoides* are characteristic in having strongly revolute margins.

Specimens examined. SOUTH AFRICA. Oudtshoorn: lower northern slopes of Outeniqua Mountains on farm Klein Moerasrivier, *Schutte 801* (JRAU), *Vlok 2437* (JRAU), *2640* (B, BOL, JRAU, K, MO, NBG, PRE). Mossel Bay: Attaquaskloof Nature Reserve, *Vlok 2500* (JRAU).

6. Xiphotheca tecta (Thunb.) A. L. Schutte & B.-E. van Wyk, Taxon 42: 48. 1993. *Liparia tecta* Thunb., Prodr. Pl. Cap.: 124. 1800. *Priestleya tecta* (Thunb.) DC., Prodr. 2: 122. 1825. TYPE: South Africa. Western Cape, "Paardeberg, Picketberg, Hottentots Hollandberg," *Thunberg s.n.* (lectotype, designated by Schutte & Van Wyk (1993), UPS, Herb. Thunberg No. 17009; isolectotype, S).

Xiphotheca rotundifolia Eckl. & Zeyh., Enum. Pl. Afric. Austral. 2: 166. 1836. *Priestleya rotundifolia* (Eckl. & Zeyh.) Walp., Linnaea 13: 469. 1839. *Priestleya tecta* var. *rotundifolia* (Eckl. & Zeyh.) Harv., Fl. Cap. 2: 20. 1862. TYPE: South Africa. Western Cape, "In lapidosis laterum montium prope Waterfall in valle Tulbagh (Worcester)," *Ecklon & Zeyher 1224* (lectotype, designated by Schutte & Van Wyk (1993), S; isolectotype, S).

Xiphotheca polycarpa Eckl. & Zeyh., Enum. Pl. Afric. Austral. 2: 166. 1836. TYPE: South Africa. Western Cape, "In locis lapidosis laterum montium prope Klapmuts (Stellenbosch)," *Ecklon & Zeyher 1225* (lectotype, designated by Schutte & Van Wyk (1993), S; isolectotypes, S, W).

Priestleya stokoei L. Bolus, Ann. Bolus Herb. 4: 69. 1927. TYPE: South Africa. Western Cape, Stellenbosch division, foothills of mountains near Lourensford, Somerset West, *Stokoe 1375* (holotype, BOL).

Many-stemmed shrub up to 1 m tall, sprouting from a woody rootstock after fire. *Leaves* alternate, elliptic to almost circular, flat, often concave, densely pubescent to tomentose on both surfaces, glabrescent. *Inflorescences* borne along main branches; peduncle absent. *Bracts* linear, 2.5–7.5 mm long. *Pedicel* 2–4 mm long. *Bracteoles* minute, caducous. *Calyx* not intrusive at base; lobes acuminate to acute, slightly longer than the tube; carinal lobe as long as lateral lobes; densely pubescent. *Wing petals* not auriculate; pocket conspicuous on the outer surface. *Ovary* with 5–8 ovules; densely pubescent. *Pods* laterally compressed; densely tomentose. *Seeds* green, not mottled. Figure 5.

Xiphotheca tecta has a relatively wide distribution in the Western Cape, extending from Citrusdal in the north to Somerset West in the south (Fig. 6). It occurs on shale or granite soil at altitudes of 200 to 1350 m.

This species is unique in having a pocket on the wing petals that is conspicuous on the outer surface.

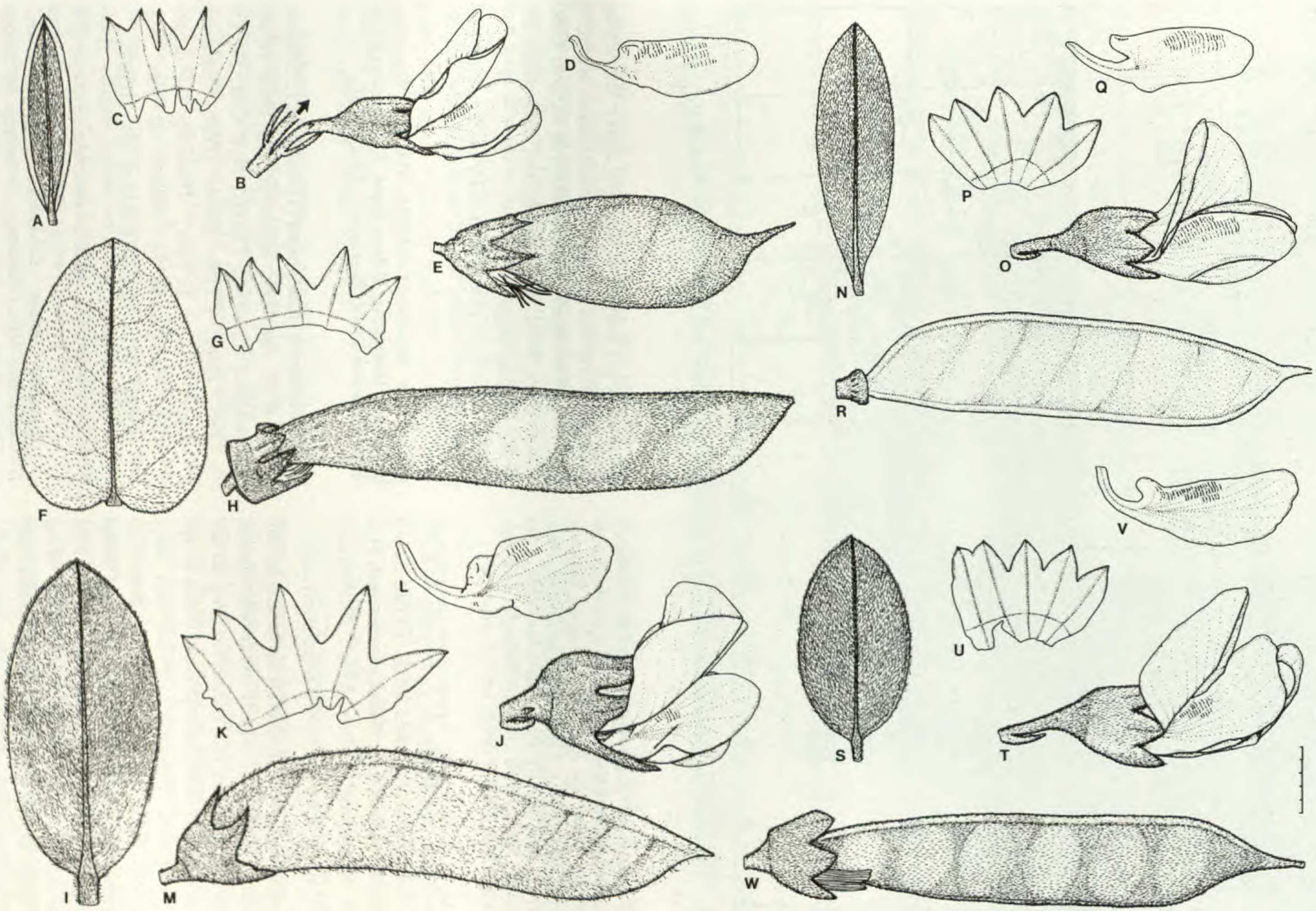

Figure 5. A–E. *Xiphotheca phylicoides*. F–H. *X. cordifolia*. I–M. *X. tecta*. N–R. *X. canescens*. S–W. *X. elliptica*. A, F, I, N, S: leaves, abaxial view; B, J, O, T: flowers in lateral view (note the presence of peduncle in B); C, G, K, P, U: calyces (upper lobes to the left); D, L, Q, V: wing petals; E, H, M, W: immature fruits; R: mature fruit. A–D: *Vlok 2640*; E: *Schutte 801*; F–H: *Esterhuysen 32556*; I–L: *Schutte 597*; M: *Schutte 767*; N–Q: *Vlok & Schutte 46*; R: *Stirton 11032*; S: *Grobbelaar 1176*; T–V: *Taylor 6930*; W: *Taylor 7217*. Scale in mm.

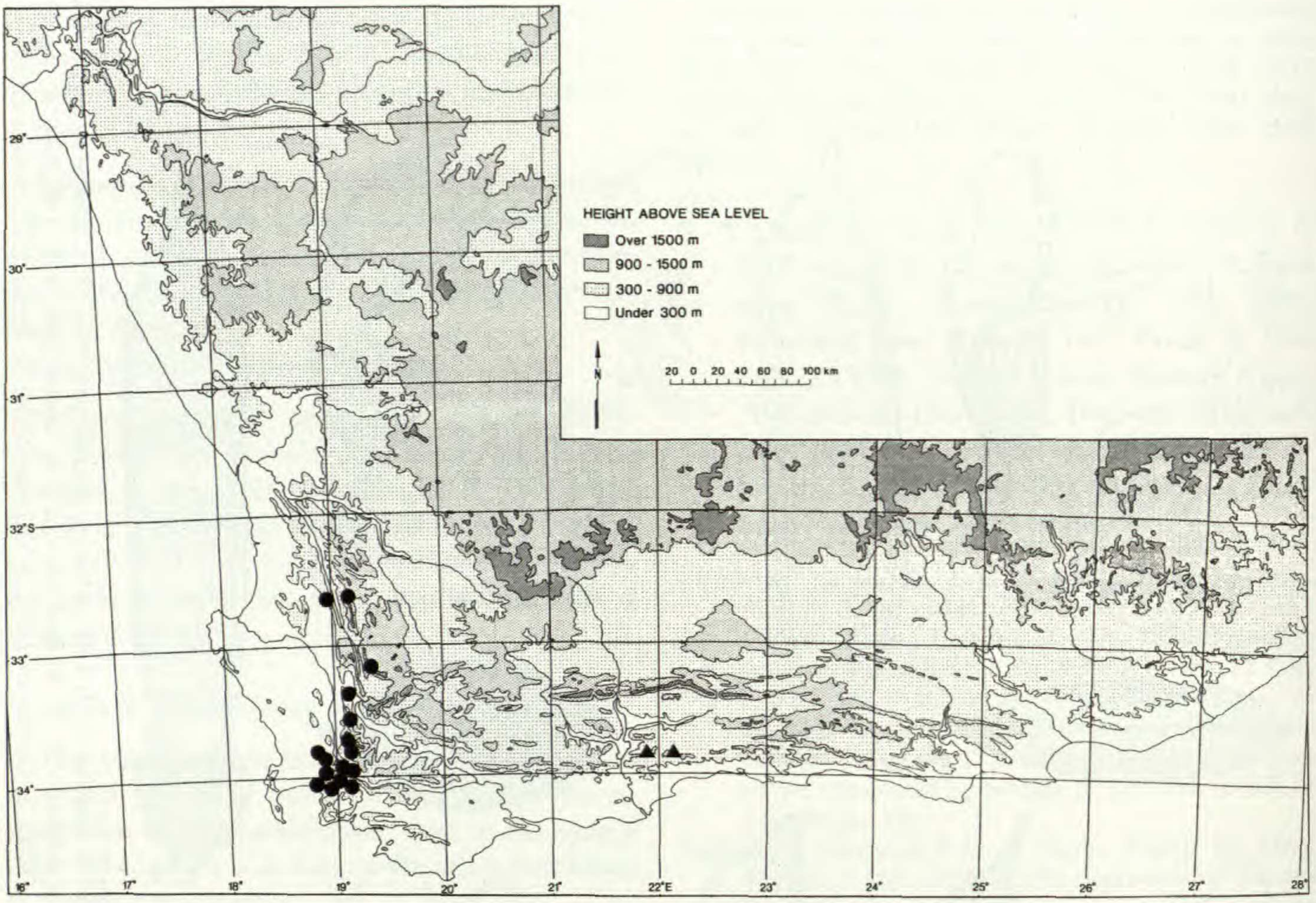

Figure 6. The known geographical distribution of *Xiphotheca tecta* (dots) and *X. phylicoides* (triangles).

Selected specimens examined. SOUTH AFRICA. Paarl: French Hoek Pass, *Bond 359* (NBG). Stellenbosch: Banhoek Valley, below the hut below Dragoon Buttress, *Esterhuysen 35653* (BOL). Citrusdal: Elandskloof Pass, *Schutte 701* (B, MO, JRAU). Paarl: Worcester side of Du Toitskloof Pass, *Schutte 714* (JRAU). Tulbagh: near Tulbagh Waterfall, *Stokoe 1399* (BOL).

7. Xiphotheca cordifolia A. L. Schutte & B.-E. van Wyk, Taxon 42: 48. 1993. TYPE: South Africa. Western Cape, Worcester district, Hex River Mountains, Milner Kloof, *Esterhuysen 31640* (holotype, BOL; isotypes, K, S).

Single-stemmed, tree-like shrub up to 2.5 m tall, not sprouting after fire; woody rootstock absent. *Leaves* opposite, cordate, flat, pubescent only on abaxial surface, glabrescent. *Inflorescences* borne at tips of lateral branches; peduncle 1.0–2.5 mm long. *Bracts* not seen. *Pedicel* 2.0–2.5 mm long. *Bracteoles* minute, caducous. *Calyx* intrusive at base; lobes acuminate, slightly longer than the tube; carinal lobe as long as lateral lobes; densely pubescent. *Wing petals* not seen. *Ovary* with 4–6 ovules; densely pubescent. *Pods* laterally compressed; densely pubescent. *Seeds* uniformly brown. Figure 5.

The extremely limited geographical distribution of *X. cordifolia* is illustrated in Figure 7. It has been recorded only from the Hex River Mountains north of Worcester in the Western Cape, where it grows in rocky areas at streamsides at 1333 to 1666 m above sea level. The only known collections are in the fruiting stage.

This species is characterized by its opposite, cordate leaves.

Specimens examined. SOUTH AFRICA. Worcester: Hex River Mountains, Milner Kloof, *Esterhuysen 32556* (BOL); Moraine Kloof, *Esterhuysen 35642* (BOL).

8. Xiphotheca canescens (Thunb.) A. L. Schutte & B.-E. van Wyk, Taxon 42: 46. 1993. *Hypocalyptus canescens* Thunb., Nov. Gen. Pl. 11: 153. 1800. TYPE: South Africa. Northern Cape, "e Cap. b. Spei," *Thunberg s.n.* (lectotype, designated by Schutte & Van Wyk (1993), UPS, Herb. Thunberg No. 16339).

Priestleya schlechteri L. Bolus, Ann. Bolus Herb. 4: 125. 1928. TYPE: South Africa. Northern Cape, Calvinia division, Onder Bokkeveld, "Oorlogs-kloof," *Schlechter 10943* (lectotype, designated by Schutte & Van Wyk (1993), BOL; isolectotypes, BM, BOL, G, K, LD, S, W, Z).

Single-stemmed, tree-like shrub up to 2.5 m tall, not sprouting after fire; woody rootstock absent.

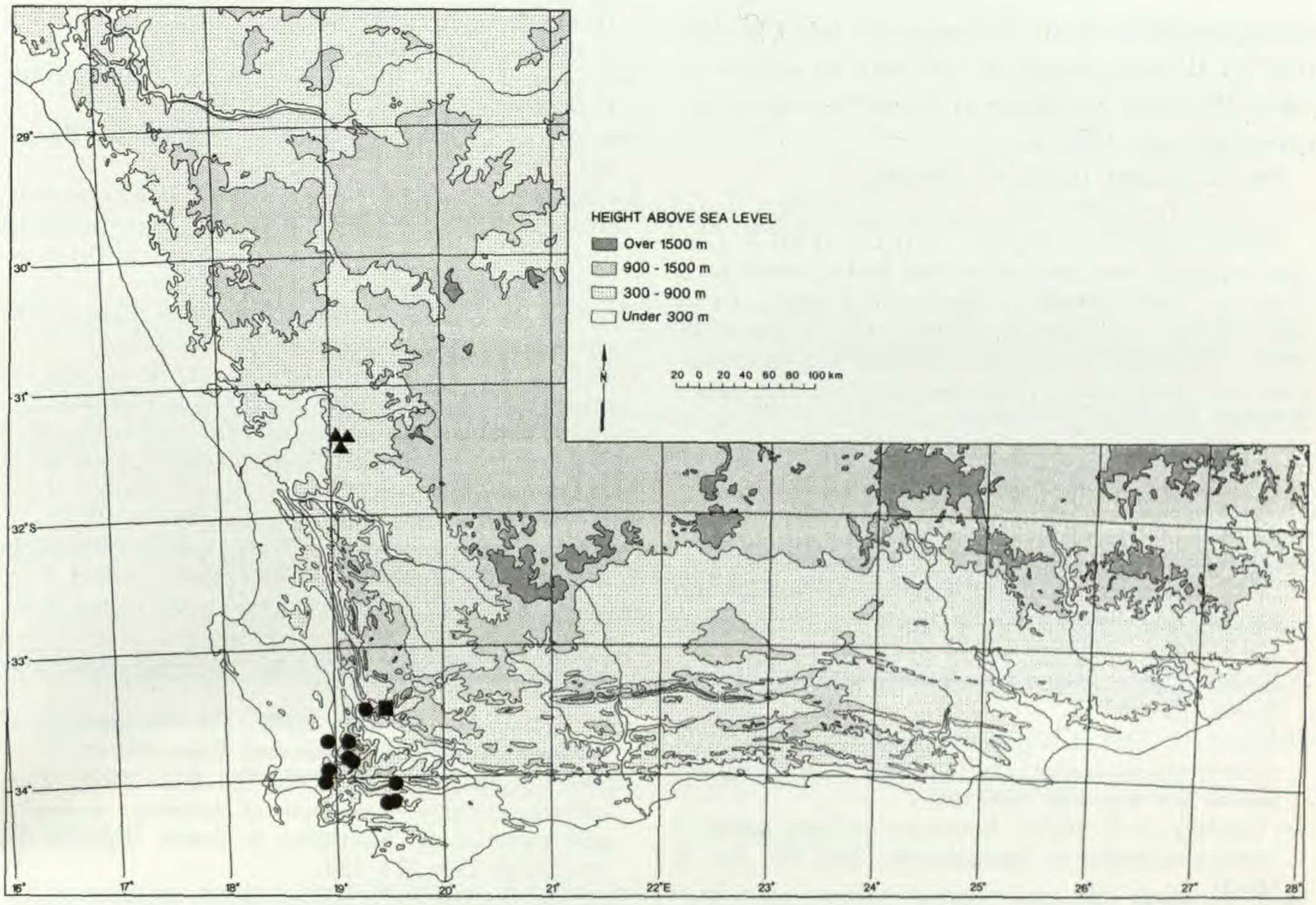

Figure 7. The known geographical distribution of *Xiphotheca canescens* (triangles), *X. elliptica* (dots), and *X. cordifolia* (square).

Leaves alternate, narrowly elliptic, flat, densely pubescent on both surfaces, glabrescent. *Inflorescences* borne at tips of lateral branches; peduncle 1.0–2.5 mm long. *Bracts* linear, ± 2 mm long. *Pedicel* 2–3 mm long. *Bracteoles* minute, caducous. *Calyx* not intrusive at base; lobes acute, shorter than the tube; carinal lobe as long as lateral lobes; densely pubescent. *Wing petals* distinctly auriculate; pocket inconspicuous on outer surface. *Ovary* with 5–8 ovules; densely pubescent. *Pods* compressed; ± glabrous. *Seeds* uniformly brown. Figure 5.

Xiphotheca canescens is a rare and highly localized species, known only from the area around Nieuwoudtville in the Northern Cape (Fig. 7). It occurs on shallow Table Mountain Sandstone in rocky areas at altitudes of 660 to 780 m.

The species is closely related to *X. elliptica*, but deviates in being a non-sprouter and having narrowly elliptic leaves with flat margins. *Xiphotheca elliptica* is a sprouter and has elliptic leaves, with slightly recurved margins.

Selected specimens examined. SOUTH AFRICA. Nieuwoudtville: Oorlogs Kloof, *Compton 20892* (NBG); top of Van Rhyns Pass, *Goldblatt 2469* (NBG); 4 mi. W of Nieuwoudtville, *Lewis s.n.* (SAM 64929); Farm Klein Arendskraal, *Van Wyk 1343* (JRAU), Farm Hotbergfontein, *Vlok & Schutte 46* (MO).

9. Xiphotheca elliptica (DC.) A. L. Schutte & B.-E. van Wyk, Taxon 42: 46. 1993. *Priestleya elliptica* DC., Prodr. 2: 122. 1825. TYPE: South Africa. Western Cape, "Cap. de B. Esp.," *Lambert s.n.* (lectotype, designated by Schutte & Van Wyk (1993), G-DC).

Ingenhoussia verticillata E. Mey., Comm. Pl. Afr. Austr. 1: 21. 1836. TYPE: South Africa. Western Cape, "Dutoitskloof, 3000–3500 ped.," *Drége s.n.* (lectotype, designated by Schutte & Van Wyk (1993), P; isolectotypes, K, S).

Many-stemmed shrub up to 1 m tall, sprouting from a woody rootstock after fire. *Leaves* suboppposite, elliptic, margins slightly recurved, densely pubescent on both surfaces, glabrescent. *Inflorescences* borne at tips of lateral branches; peduncle 1.0–1.5 mm long. *Bracts* linear, 2.0–2.5 mm long. *Pedicel* 3.5–4.0 mm long. *Bracteoles* minute, caducous. *Calyx* not intrusive at base; lobes acute, shorter than the tube; carinal lobe as long as lateral lobes; densely pubescent. *Wing petals* distinctly auriculate; pocket inconspicuous on outer surface. *Ovary* with 5 or 6 ovules; densely pubescent. *Pods* laterally compressed; densely pubescent. *Seeds* uniformly brown. Figure 5.

The distribution of *X. elliptica* is limited to the

mountains above Paarl, Stellenbosch, and Caledon (Fig. 7). It grows on granite soil with an overlay of Table Mountain Sandstone at altitudes ranging between 365 and 1400 m.

See discussion under *X. canescens.*

Selected specimens examined. SOUTH AFRICA. Caledon: roadside between Caledon and Rivier Sonder End, *Cloete s.n.* (SAM 60986). Stellenbosch: Banhoek, *Lamb 3311* (SAM). Stellenbosch: Helderberg, *Parker 3742* (NBG). Caledon: Genadendal, Baviaansberg Mountain, *Prior s.n.* (SAM 15185). Paarl: Wemmershoek Mountains, Tierkloof, *Wasserfall 510* (NBG).

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